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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER	
MISLEH, JUSTIN P	

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2612	

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/406,882	BURNS, PETER D.	
	Examiner	**Art Unit**	
	Justin P Misleh	2612	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on 19 February 2004.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1 - 31 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) 24,25 and 31 is/are allowed.

6)☒ Claim(s) 1 - 4, 6 - 17, 19 - 23, 26, 27, and 31 is/are rejected.

7)☒ Claim(s) 5,18,26,28,29 and 31 is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Response to Arguments

1. Applicant's arguments filed 19 February 2004 have been fully considered but they are not persuasive.

<u>Examiner's Interpretation of the Applicant's Conceded Prior Art</u>

The Applicant's invention is directed toward the digital correction of misregistration of digital color records. Thus, the Examiner would like to summarize what the Applicant regards as prior art, as stated by the Applicant on page 1 (line 11) – page (line 8) of the specification.

Initially, the Applicant explains several sources of color misregistration including chromatic aberrations of the optical system, resulting is in a "lateral color" error, and the absence of knowledge of consistent coordinates for all color records.

Next, the Applicant explains prior art methods for bringing image color-records into registration. The first method cited by the Applicant includes the method of U.S. Patent No. 4,849,914 wherein image processing is performed to detect the location of the corresponding edge features in separate color records in which these parameters are used by a machine that moves film separations into alignment. The second method cited by the Applicant includes the method of U.S. Patents No. 5,475,428 and 5,325,190 wherein digital image processing including bilinear interpolation is used to compensate for both time-sequence image records and color misregistration correction.

Finally, in an attempt to identify a problem with the prior art, the Applicant explains the use of digital filters in digital image processing. The Applicant states that it is quite common to design a digital FIR filter for noise reduction and/or sharpening wherein the desired characteristics of the FIR filter are expressed in terms of a modulation transfer function (MTF), in the time domain, and in terms of a discrete Fourier transform (DFT), in the frequency domain, thereby resulting in a digital filter that has both an MTF and a phase transfer function (PTF). Thus, if the filter matrix were symmetrical about its center (in two directions), the result would be a linear phase design. Furthermore, the Applicant introduces a digital filter having a net effect operation of a designed (non-unity) MTF and linear phase response.

The Applicant concludes its recognition of the prior art by stating, that current signal processing, including the bilinear interpolation and digital FIR filter methods described above, are not designed for a desired phase response, nor for both desired phase and modulus responses. These filters, moreover, are not used or suggested for color misregistation.

<u>Examiner's Interpretation of the Applicant's Present Invention</u>

To overcome the deficiencies in the prior art, the Applicant's invention thus resides in a digital processing method wherein a measurement of the translation error between, color records is computed from the actual acquire image wherein the translation errors are used to directly design FIR filters with a desired phase response for each color record and a desired modulus response thereby overcoming methods using interpolation without any additional computation.

Examiner's Interpretation of the Applicant's Arguments

In the Final Rejection (Paper No. 6, 19 November 2003), the Examiner rejected independent Claims 1 and 14 under 35 U.S.C. 102(b) as being anticipated by Yamamoto et al.

In summary, Yamamoto et al. disclose, as stated throughout, a method for correcting color misregistration in a digital image by making use of a digital FIR filter wherein the digital FIR filter has a desired phase response, that compensates for the shift, and a desired modulus response. The Examiner directly pointed out this feature, of Yamamoto et al., in both the Non-Final Office Action (Paper No. 4, 2 July 2003) and the Final Office. In the Amendment (Paper No. 7, 19 February 2004), the Applicant states that the Office Actions have been reviewed and the language added by earlier amendment to Claims 1 and 14 has been revised. Furthermore, the Applicant argues "Claims 1 and 14 require that the digital records each have two dimensions and requires processing of at least one of the digital records with a two-dimensional digital filter independently of the other digital records. Yamamoto et al., in contrast, teaches against a linear interpolation method processing independently of other records and then describes the invention of Yamamoto et al., a compensation processing technique that uses signal from three records", as stated in column 5, line 46 to column 6 line 1.

Therefore, it is clear that the Applicant does not contest that Yamamoto et al. disclose, as stated throughout, a method for correcting color misregistration in a digital image by making use of a digital FIR filter wherein the digital FIR filter has a desired phase response, that compensates for the shift, and a desired modulus response. Rather, the Applicant believes that Yamamoto et al. does not disclose, at least, detecting a similar feature in two or more digital records wherein the digital records each have two dimensions and processing at least one of the

digital records with a two-dimensional digital filter independently of the other said digital records.

Examiner's Rebuttal to the Examiner's Interpretation of the Applicant's Arguments

In the Final Office Action, the Examiner stated "Yamamoto et al. teach of several different embodiments with focus primarily around a single one of those embodiments. The primary embodiment of Yamamoto et al. is comprised of the acquisition of a digital color record using a single row color image sensor wherein each color is arranged sequentially along the direction of the row. In the primary embodiment, Yamamoto et al. address color misregistration in a single 'dimension' along the direction of the row.

"In addition, Yamamoto et al. provides several other embodiments in which color misregistration is addressed in two 'dimensions.' The Examiner directs the Applicant to column 16 (lines 7 – 45) of Yamamoto et al. In other embodiments, the color image sensor is not comprised of solely a single row, rather a plurality of single rows wherein each single row pertains to a particular color. In this embodiment, to completely acquire a digital color record, the image sensor is moved in a direction perpendicular to the direction of the row. Hence, a digital color record is acquired in two 'dimensions': the first being along the direction of the row and the second being along the direction perpendicular to the row. Therefore, not only do Yamamoto et al address the color misregistration in a single 'dimension' along the direction of the row, but in a second 'dimension' along the direction perpendicular to the row.

"In another embodiment, Yamamoto et al. again uses a single row color image sensor wherein each color aperture along the direction of the row is of a different size. Therefore, in

this embodiment, the first 'dimension' is the direction along the row and the second 'dimension' is the difference in aperture sizes in the direction along the row. Yamamoto et al. again address color misregistration in two 'dimensions.'

As stated above, Yamamoto et al. disclose several embodiments in which the digital color records are in two 'dimensions.' In addition, the processor of Yamamoto et al. easily performs processing in two 'dimensions' (stages, steps, etc.). Therefore, making amendments to claims 1 and 14 as the presented by the Applicant is simply not enough to overcome Yamamoto et al."

In the Non-Final Office and the Final Office Action, the Examiner argued that Yamamoto et al. disclose two-dimensional digital color records. For example, Yamamoto et al. teach color registration correction, which is the correction of the error between color spacing differences in each pixel (approximately 1/3 of each pixel) since each color within the pixel is not in the same position, through the use of a digital filter in which the coefficients for amplitude and phase compensation are predetermined in the exemplary embodiment (figure 1) or through the feature/shift detection of each dot in the present embodiment (figure 8). The colors within each pixel were referred to as digital records wherein each digital record is wavelength-dependent (either Red, Green, Blue or Cyan, Magenta, Yellow).

The Examiner believes Yamamoto et al. continues to disclose two-dimensional digital color records, wherein in another interpretation the digital color records are not referred to as the colors within each pixel, rather a plurality of pixels as a whole comprises a digital color record. Nonetheless, the Examiner is aware that Yamamoto et al. discloses in several embodiments, as stated above, the correction of dot sequential error within each pixel of the plurality of pixels within a two-dimensional digital color record (of the new interpretation), independently of a

plurality of two-dimensional digital color records captured of the same scene. Yamamoto et al. frankly does not disclose in extreme detail the correction of color misregistration of a single two-dimensional digital color record among a plurality of two-dimensional digital color records.

However, Yamamoto et al. disclose, in minute detail, options regarding application of the concepts presented within Yamamoto et al. As stated in column 16 (lines 28 – 45), the present invention would also be effective in correcting differences in phase and resolution characteristics among R, G, and B signal components resulting from factors other than the structure of the sensor used (referring to those described in detail in embodiments explained above). For example, the correction process of the present invention would also be effective in the case where there are difference in resolution of phase among R, G, and B signals resulting from the chromatic aberration of an image optical system used."

In the Information Disclosure Statement, the Applicant provided a reference detailing chromatic aberration of an optical system, written by Eugene Hecht. It is clear from the reference that chromatic aberration of an optical system results in constituent colors of a collimated beam of white light are focused at a different point on the optical axis. Chromatic aberrations are easily identified because the optical system will cast a real image surrounded by a halo. Thus, the image of an off-axis point will be formed of the constituent frequency components each arriving at a different height above the axis. With such a configuration one would see all the other colored images superimposed and slightly out of focus, producing a whitish blur or hazed overlay.

Thus, simply performing dot sequential error correction as detailed in the embodiments (as stated above) would simply not correct for chromatic aberrations of the optical system.

However, Yamamoto et al. clearly states, that although not detailed, the present invention would also be effective in correcting differences in phase and resolution characteristics among R, G, and B signal components resulting from the chromatic aberration of an image optical system used. Therefore, the "signal components" R, G, and B would be each represented as a two-dimensional digital color record and the digital filter would have to be a two-dimensional digital filter correcting for the color misregistration between the two-dimensional digital color records.

<u>Examiner's Belief of the Patentable Aspect of the Applicant's Present Invention</u>

The Examiner believes that the patentable aspect of the Applicant's invention lies within detecting a feature within the digital color records rather trying to overcome the prior art by specifying dimensions of the digital records. More specifically, detecting a feature using elements of the spatial frequency response method for a slanted edge feature according to the ISO 12233:2000 standard is not taught or suggested in the prior art, as elaborated on below.

Claim Objections

2. **Claims 26 and 31** are objected to because of the following informalities: identical claim language and dependent from the same parent claim. Appropriate correction is required.

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

4. **Claims 1, 2, 4, 6 – 9, 12 – 15, 17, 19 – 22** and 27 are rejected under 35 U.S.C. 102(b) as being anticipated by Yamamoto et al.

For the following rejections, please refer to figures 1, 3, and 8 and columns 4 (lines 42 – 56), 5 (lines 14 – 68), 6 (lines 1 – 15 and 65 – 68), 7 (lines 1 – 20 and 47 – 68), 8 (lines 1 – 9), 9 (lines 38 – 68), 10 (lines 1 – 61), 11 (lines 21 – 68), 12 (lines 1 – 65), and 16 (lines 7 – 45).

5. For **Claim 1**, Yamamoto et al. teach color registration correction, which is the correction of the error between color spacing differences in each pixel (approximately 1/3 of each pixel) since each color within the pixel is not in the same position, through the use of a digital filter in which the coefficients for amplitude and phase compensation are predetermined in the exemplary embodiment (figure 1) or through the feature/shift detection of each dot in the present embodiment (figure 8).

Yamamoto et al. disclose two-dimensional digital color records, wherein a plurality of pixels as a whole comprises a digital color record. Nonetheless, the Examiner is aware that Yamamoto et al. discloses in several embodiments, as stated above, the correction of dot sequential error within each pixel of the plurality of pixels within a two-dimensional digital color record (present interpretation), independently of a plurality of two-dimensional digital color records captured of the same scene. Yamamoto et al. frankly does not disclose in <u>extreme detail</u> the correction of color misregistration of a single two-dimensional digital color record among a plurality of two-dimensional digital color records.

However, Yamamoto et al. disclose, in <u>minute detail</u>, options regarding application of the concepts presented within Yamamoto et al. As stated in column 16 (lines 28 – 45), the present

invention would also be effective in correcting differences in phase and resolution characteristics among R, G, and B signal components resulting from factors other than the structure of the sensor used (referring to those described in detail in embodiments explained above). For example, the correction process of the present invention would also be effective in the case where there are difference in resolution of phase among R, G, and B signals resulting from the chromatic aberration of an image optical system used."

In the Information Disclosure Statement, the Applicant provided a reference detailing chromatic aberration of an optical system, written by Eugene Hecht. It is clear from the reference that chromatic aberration of an optical system results in constituent colors of a collimated beam of white light are focused at a different point on the optical axis. Chromatic aberrations are easily identified because the optical system will cast a real image surrounded by a halo. Thus, the image of an off-axis point will be formed of the constituent frequency components each arriving at a different height above the axis. With such a configuration one would see all the other colored images superimposed and slightly out of focus, producing a whitish blur or hazed overlay.

Thus, simply performing dot sequential error correction as detailed in the embodiments (as stated above) would simply not correct for chromatic aberrations of the optical system. However, Yamamoto et al. clearly states, that although not detailed, the present invention would also be effective in correcting differences in phase and resolution characteristics among R, G, and B signal components resulting from the chromatic aberration of an image optical system used. Therefore, the "signal components" R, G, and B would be each represented as a two-

dimensional digital color record and the digital filter would have to be a two-dimensional digital filter correcting for the color misregistration between the two-dimensional digital color records.

In regards to Claim language, Yamamoto et al. disclose, a method for improving the wavelength dependent registration of digital images, said method comprising the steps of:

Detecting a similar feature (in image feature detector 4) in two or more digital records (signal components R, G, and B) of the same original search digital record being wavelength-dependent, said digital records each having two dimensions (The similar feature detected is the edge of the digital records with respect to each other within each pixel and surrounding pixels. Once the similar feature is detected, the image feature detector chooses the second set of coefficients to use for compensation.);

Determining from the feature a shift due to misregistration of as least one of the digital records relative to another of the digital records (As stated above, the edge feature is detected for the digital records with respect to each other within each pixel and the neighboring pixels. When an edge is present, the second set of coefficients is used, which are determined from the shifts in the digital records. As shown in figure 3, the digital records of a pixel are not in the same position as one another, therefore, their misregistration is a shift due to displacement); and

Processing (performed in compensation circuit 2) at least one of said digital records with a two-dimensional digital filter (compensation circuit 2, as shown in detail in figure 1) independently of the other said digital records, said digital filter having a phase response that compensates for the shift, thereby providing a correction for the

wavelength-dependent misregistration between the digital records (please see column 11, lines 43 – 46, and column 5, lines 61 – 68, and column 6, lines 1 – 15).

6. For **Claim 14**, also see Claim 1 rejection, Yamamoto et al. disclose, a computer program product for improving the color registration of digital images comprising: a computer readable storage medium having a computer program stored thereon for performing the steps of (Although not explicitly taught, it is inherent that a computer readable storage medium having a computer program stored thereon, since Yamamoto et al. teach of an entirely digital system incapable of operation without microprocessor/CPU instruction driven control):

Detecting a similar feature (in image feature detector 4) in two or more digital records (signal components R, G, and B) of the same original search digital record being wavelength-dependent, said digital records each having two dimensions (The similar feature detected is the edge of the digital records with respect to each other within each pixel and surrounding pixels. Once the similar feature is detected, the image feature detector chooses the second set of coefficients to use for compensation.);

Determining from the feature a shift due to misregistration of as least one of the digital records relative to another of the digital records (As stated above, the edge feature is detected for the digital records with respect to each other within each pixel and the neighboring pixels. When an edge is present, the second set of coefficients is used, which are determined from the shifts in the digital records. As shown in figure 3, the digital records of a pixel are not in the same position as one another, therefore, their misregistration is a shift due to displacement); and

Processing (performed in compensation circuit 2) at least one of said digital records with a two-dimensional digital filter (compensation circuit 2, as shown in detail in figure 1) independently of the other said digital records, said digital filter having a phase response that compensates for the shift, thereby providing a correction for the wavelength-dependent misregistration between the digital records (please see column 11, lines 43 – 46, and column 5, lines 61 – 68, and column 6, lines 1 – 15).

7. As for **Claims 2 and 15**, Yamamoto et al. disclose, wherein step (a) comprises detecting a graphical element in each of the digital records. Yamamoto et al. teach detecting a similar feature (in image feature detector 4) in two or more digital records (signal components R, G, and B) of the same original search digital record being wavelength-dependent. The similar feature detected is the edge of the digital records with respect to each other within each pixel and surrounding pixels. Once the similar feature is detected, the image feature detector chooses the second set of coefficients to use for compensation. Therefore, since the shift is due to displacement of the digital records within a pixel within a linear array of pixels, it is detecting a graphical element (shift relative to another digital record) in each of the digital records.

8. As for **Claims 4, 17, and 27**, Yamamoto et al. disclose, wherein step (a) comprises detecting an edge feature in each of the digital records. The image feature detector resembles an edge detector since it decides upon which set of coefficients to use in compensation based upon the features it detects in the present pixel from the neighboring pixels. For example, as stated in column 12 (lines 24 – 52), when the nearest neighboring pixels have large differences in lightness, hence an edge in the present pixel, the second set of coefficients (shift determination

relative to the green color record) are used and when the nearest neighboring pixels are close in lightness, the first set of coefficients are used (similar to conventional linear interpolation).

9. As for **Claims 6 and 19**, Yamamoto et al. disclose, as stated in columns 11 (lines 67 and 68) and 12 (lines 1 – 11) wherein step (b) comprises computing a difference in pixel location of the feature located in said at least one digital record relative to the same feature located in said another of the digital records. The image feature detector detects the edge feature in the present digital record from the lightness in the surrounding digital records. Once an edge is detected in the present digital record, a reference digital record is chosen (Green) and the pixel differences/correction coefficients are calculated.

10. As for **Claims 7, 20, 26, and 31**, Yamamoto et al. disclose, wherein step (c) comprises processing the digital records with a FIR filter having an asymmetric response represented by a set of coefficients (see table 1 in column 6). Although Yamamoto et al. do not explicitly disclose a FIR filter; it is inherent that a FIR filter is used since the digital filter is used for phase compensation. IIR filters distort the phase of the signal by not delaying the input signal, therefore rendering the method of Yamamoto et al. in operable.

11. As for **Claims 8 and 21**, Yamamoto et al. disclose, wherein step (c) comprises using a set of precalculated coefficients selected from a plurality of sets precalculated coefficients for various pixel shifts. As stated above, Yamamoto et al. teach color registration correction through the use of a digital filter in which the coefficients for amplitude and phase compensation are predetermined. The image feature detector (4) of figure 8 decides between two separate and different sets of coefficients for the compensation process. The first set of coefficients is determined based upon the shift/spacing differences between each color within a pixel. The

second set of coefficients is determined based upon the features of neighboring pixels. The image feature detector decides upon which set of coefficients to use in compensation based upon the features it detects in neighboring pixels.

12. As for **Claims 9 and 22**, Yamamoto et al. disclose, wherein step (c) comprises processing said at least one of the digital records with digital filter having a magnitude response that compensates for and aspect of the digital recorded other than misregistration. It is inherent that the coefficients used for compensation from the digital filter with a magnitude (amplitude) response and a phase response. The phase response inherently shifts the digital records while the magnitude response inherently brightens the digital records. Yamamoto et al. explicitly teach the design of the filter coefficients to compensate for phase and resolution errors (see columns 5, lines 61 – 68, and 6, lines 1 – 15).

13. As for **Claim 12**, Yamamoto et al. disclose, a method as claimed in claim 1 wherein the digital records are red, green, and blue records (see figure 1).

14. As for **Claim 13**, Yamamoto et al. disclose, as stated in columns 5 (lines 46 – 68) and 6 (lines 1 – 64), a method as claimed in claim 12 wherein said another of the records in step (b) is the green color record and the red and blue color records are filtered in step (c) to correct for color misregistration between the red and blue color records and the green color record. As shown with equation set 2 in column 5 and as stated in column 9 (lines 37 – 61), the similar feature detected is the shift of the digital records with respect to each other, including a green color record as the reference, within each pixel. As shown in figure 3, the digital records of a pixel are not in the same position as one another, therefore, their displacement is a shift due to

misregistration and the filtering for compensation is provided for the color records, including red and blue.

Claim Rejections - 35 USC § 103

15. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

16. **Claims 3 and 16** are rejected under 35 U.S.C. 103(a) as being unpatentable over Yamamoto et al. in view of Herman et al.

17. As for **Claims 3 and 16**, Yamamoto et al. disclose a method of dot sequential error correction, correcting the color misregistration of the multicolor linear image sensor as shown in figure 3. Yamamoto et al. teach color registration correction, which is the correction of the error between color spacing differences in each pixel (approximately 1/3 of each pixel), since each color within the pixel is not in the same position, through the use of a digital filter in which the coefficients for amplitude and phase compensation are predetermined in the exemplary embodiment (figure 1) or through the feature/shift detection of each dot in the present embodiment (figure 8). Yamamoto et al. disclose, detecting a graphical element in each of the digital records. However, Yamamoto et al. do not disclose computing a centroid of the graphical element. Herman et al. also disclose an image registration system. However, Herman et al. teach of the image registration/alignment of frames of color mosaics. As stated in column 22

(lines 31 – 65) and as shown in figures 7 and 15, to align the mosaic images with one another Herman et al. computes a centroid for a graphical element in each image. As stated in column 22 (lines 58 – 60), at the time the invention was made, one with ordinary skill in the art would have been motivated to compute the centroid of a graphical element in an image as taught by Herman et al. in the color registration system with graphical element detection of Yamamoto et al. as means to minimize distortion of the images to be aligned at the edges after alignment. Therefore, it would have been obvious to one with ordinary skill in the art to have computed the centroid of a graphical element in an image as taught by Herman et al. in the color registration system with graphical element detection of Yamamoto et al.

18. **Claims 10, 11, and 23** are rejected under 35 U.S.C. 103(a) as being unpatentable over Yamamoto et al.

19. As for **Claims 10 and 23**, Yamamoto et al. disclose processing at least one of the digital color records with a digital filter having a phase response that compensates for the shift and a magnitude response that compensates for an aspect of the digital recorded other than misregistration. Yamamoto et al. do not disclose wherein the digital filter is obtained by convolving a first digital filter having a phase response that compensates for the shift with a second digital filter having a magnitude response that compensates for an aspect of the digital records other than shift. Although, Yamamoto et al. disclose a single digital filter having both a magnitude and phase response responsible for compensating for resolution and shift, respectively, one with ordinary skill in the art would have been motivated to include two digital filters, convolving the first, which compensates for shift, with the second, which compensates for

resolution as a means to provide two separate filters in which when applied with the same correction coefficients can focus explicitly on correcting shift and resolution, independently and respectively. Therefore, at the time the invention was made, it would have been obvious to one with ordinary skill in the art to have included two digital filters, convolving the first, which compensates for shift, with the second, which compensates for resolution.

20. As for **Claim 11**, Yamamoto et al. do not disclose, as stated above, two digital filters, however it would have been obvious to do so. Yamamoto et al. disclose a digital filter, which compensates for resolution and shift (see column 5, lines 61 – 68). Therefore, Yamamoto et al. disclose wherein the second digital filter enhances the sharpness (resolution) of one or more of the digital records.

Allowable Subject Matter

21. **Claims 5, 18, 28, and 29** objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

22. **Claims 24 and 25** are allowed.

The following is a statement of reasons for the indication of allowable subject matter: The prior art does not teach or fairly suggest detecting similar features in wavelength-dependent digital records using elements of the spatial frequency response method for a slanted edge feature according to the ISO 12233 standard, which also includes computing a first derivative of the feature using a derivative filter to define one or more lines; computing a centroid of each of said and fitting a linear equation to each of the centroids.

Any inquiry concerning this communication or earlier communications from the Examiner should be directed to Justin P Misleh whose telephone number is 703.305.8090. The Examiner can normally be reached on Monday through Thursday from 7:30 AM to 5:30 PM and on alternating Fridays from 7:30 AM to 4:30 PM.

If attempts to reach the Examiner by telephone are unsuccessful, the Examiner's supervisor, Wendy R Garber can be reached on 703.305.4929. The fax phone number for the organization where this application or proceeding is assigned is 703.872.9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

JPM
April 5, 2004

NGOC-YEN VU
PRIMARY EXAMINER